INSTITUTE OF PETROLEUM REVIEW

5. No. 57. SEPTEMBER, 1951. Price 1/6d. Annual Subscription: Fifteen Shillings

PUBLIC LIBRARY
SEP 25 1951
DETROIT

LUBRICANTS

ECLIPSOL OIL CO. LTD.

ROEBUCK LANE WEST BROMWICH

PHONE:
WEST BROMWICH 0431-2-3-4

GRAMS:
SOLUBLE, WEST BROMWICH

PUBLISHED BY THE INSTITUTE OF PETROLEUM
26, Portland Place, London, W.1. Telephone No. LANgham 2250

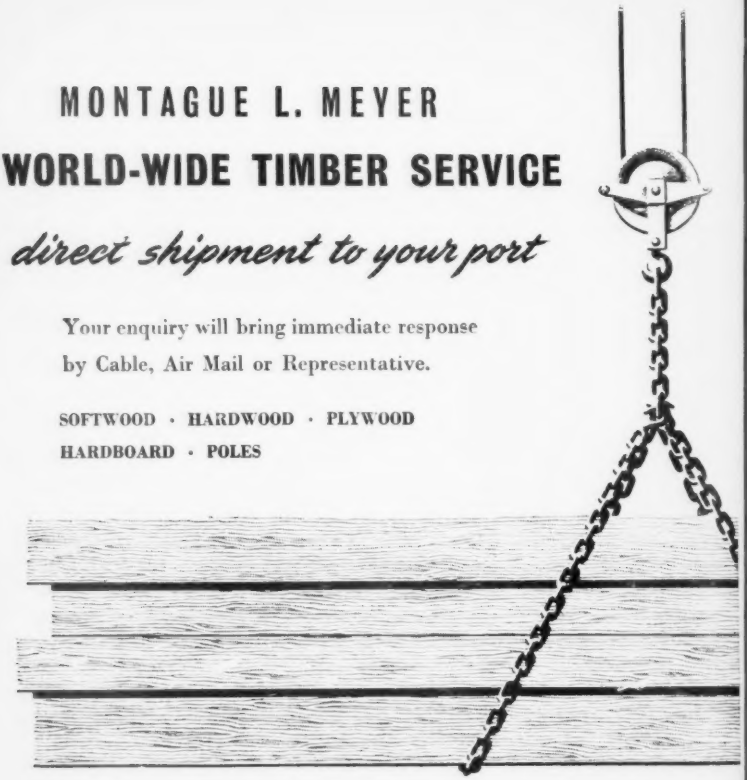
MONTAGUE L. MEYER

WORLD-WIDE TIMBER SERVICE

direct shipment to your port

Your enquiry will bring immediate response
by Cable, Air Mail or Representative.

SOFTWOOD · HARDWOOD · PLYWOOD
HARDBOARD · POLES



MONTAGUE L. MEYER LTD.

Head Office: 14 BUCKINGHAM STREET,
ADELPHI, LONDON, W.C.2

'Phone: TRAfalgar 7766

'Grams and Cables: Emelemlid, Rand, London

Branches at Manchester, Birmingham, Hull, Southampton, Newport (Mon.)

TD.

REET.

London

ngham.

Mon.)

INSTITUTE OF PETROLEUM REVIEW

Hon. Editor: F. H. Garner, O.B.E., PH.D., F.R.I.C.
Hon. Associate Editor: E. B. Evans, PH.D., M.SC., F.R.I.C.
Editor: George Sell

No. 57 SEPTEMBER, 1951 Vol. 5

CONTENTS

PATENTS AND PORTENTS, BY J. T. TYSON 301
U.K. REFINING TRADE 313
HERIOT-WATT FELLOWSHIPS 314
MODERN TECHNIQUES IN PETROLEUM TESTING, II. SPECTROMETRY IN THE PETROLEUM INDUSTRY, BY L. K. MALTBY 315
PERSONAL NOTES 321
SESSION 1951-52 322
PETROLEUM IN PARLIAMENT 323
A GLOSSARY OF PETROLEUM TERMS 324
BIRMINGHAM UNIVERSITY DEGREES 325

PATENTS AND PORTENTS*

By J. T. TYSON†

The title of this paper was chosen to be as wide and ambiguous as possible, partly because that tends to be an occupational disease with a Patent Agent and partly so as to justify the rather heterogeneous mass of material to be discussed. In the course of several years of working with patents the writer has found a surprising lack of knowledge about them among the great majority of people, including many who should know better. For that reason it is proposed to start with a general outline of the British patent system and deal later with its more specific application to the oil and allied industries.

To many people the word Patent is instinctively connected with the word monopoly. This word has become one of the standard terms of political abuse and is used by either side indiscriminately. Automatically, therefore, a patent is regarded in some quarters as tarred with the monopoly brush and something rather discreditable. Now, of course, a patent does bestow a monopoly right, but it is a right of a special nature which will certainly bear looking into.

Monopolies of one sort or another have existed for thousands of years; for example, salt was a state monopoly in ancient Rome. It is, however, only really in the last five hundred years or so that the concept of presenting individual subjects with monopolies has come into being. In England, particularly under the Tudors, these took the form of grants

*From a paper delivered to the London Branch of the Institute, December 20, 1950.

†Esso Development Co. Ltd.

to the subject of rights to control the sale or manufacture of various commodities. These were given quite arbitrarily, the service rewarded by the grant generally bearing no relation at all to the monopoly. All of these, like other grants from the Crown, were made by Letters Patent or open letters bearing the Great Seal and addressed to all and sundry. Examples of monopolies granted by Queen Elizabeth were for salt and iron and, lamentably enough, even the transportation of beer. The monopoly on salt had the effect of raising its price to the consumer from 6d to 14/- a bushel. A man called Darcy, who was a protégé of Sir Walter Raleigh, had a monopoly patent on playing cards. These were all simple things which the ordinary individual was not prepared to do without and the effect of these monopolies was really to make him pay a considerable tax, only into the pocket of an individual. A form of monopoly grant more popular in Europe than in England was the so-called "farming" of taxes. An example of this was in France, where tax was payable on all manufactured silver, and this tax was collected by the "farmer" who either bought his position or was granted it as a privilege.

Eventually, in 1623, in the reign of James I, there was passed the "Statute of Monopolies." This provided the foundation of all later legislation on patents. In brief it laid down that all monopolies should be unlawful with the exception of those legally granted to a "true and first inventor" for a prescribed term of years for what was called "a manner of new manufacture." The purpose of this was to stimulate the growth and improvement of the industry of the country. In a sense the Letter Patent granted for such a manner of new manufacture could be regarded as a bargain or contract between the Crown and the inventor. On his side the inventor provided new and useful technical information. In return the Crown gave him a monopoly right for fourteen (now sixteen) years, under which he could enjoy the sole use of his own invention without competition from others. At the end of this term the contract was over and the new information was available to be used by anyone.

This was a marked improvement over the previous situation, since the principles are fundamentally just, and, in fact, are the foundation not only of the British patent system but, in essence, of the patent system of every other civilized country. As a matter of historical interest it may be added that it appears that King Charles I seems to have interpreted this statute rather freely and a number of very questionable monopolies were granted in his reign.

With the Civil War and the Commonwealth, however, the urge to grant illegal monopolies seems to have simmered down considerably, and we can now safely turn our whole attention to the legal grant of Letters Patent for new inventions.

We are still bound to-day by the provision of the Statute of Monopolies that a patent shall be granted only for a "manner of new manufacture." The two operative words of this phrase are "new" and "manufacture." First of all let us consider the word "manufacture." It has a well-recognized general meaning in indicating some tangible product produced by the work of man. In the early seventeenth century it is reasonable to suppose that any significant improvement to industrial methods or techniques would involve manufacture, but when applied to modern conditions the limitations of this definition of a patentable invention become very apparent. Thus, it is clear that you cannot get patent protection for such suggestions as improved filing systems, methods of diagnosing diseases, and other ideas and principles which do not involve methods of manufacture. Less obvious things, such as the generation of electrical energy and the transmission of wireless

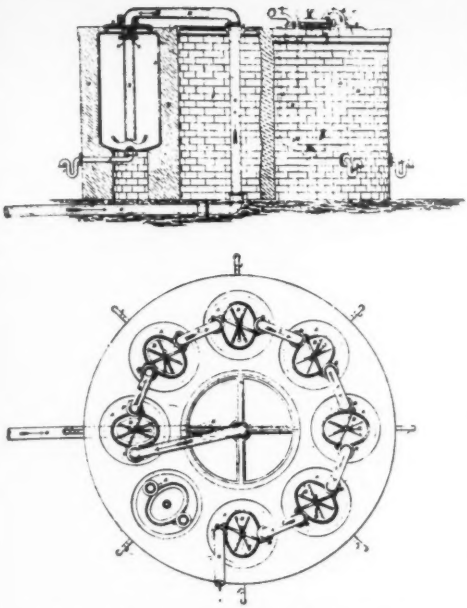


Fig. 1. B.P. No. 486/1861 (James Young). Apparatus for distilling bituminous substances.

waves are borderline cases which give rise to vigorous argument between Patent Agents and the Patent Office. Of recent years this restriction has been severely applied. For example, during the war a patent for the use of zinc chloride solution for extinguishing incendiary bombs was rejected on the grounds that the solution was a manner of manufacture but not new, while the method of putting out bombs, although new and serving a useful purpose, was not a manner of manufacture.

Another example, from the oil industry this time, of a non-patentable discovery which was refused on Appeal, was a method of prospecting for oil by the solvent extraction of drilling cores and examination of the extract for ultra-violet fluorescence which would indicate the presence of oil. Now this method is used in practice and is simple and valuable. Small instruments weighing only a couple of pounds can be bought on the open market specifically for the purpose, and these instruments, if new, would be patentable. But the method as such is not a manner of manufacture and is, therefore, not patentable. Quite apart from the conventional geological methods of forecasting and prospecting there are other simple and ingenious methods such as the infra-red analysis of subsoil gases for hydrocarbons. By just the same reasoning these are not patentable either and if only conventional apparatus is used no protection can be obtained. As a side issue, this last method will bear comparison with the "oil smellers" and "gas spotters" of the 1860's. One of these was J. S. Booker of Ohio who was blessed with sensitive muscles at the back of his neck which rose up and irritated him in the presence of natural gas. "Wildcatters" hired him to wander over promising ground, and when his hackles rose they drilled. His professional charge was $25 to $100, which really does not seem excessive.

Yet another discovery which produced no patentable invention was that *cyclo*hexane—a known substance—was an excellent aircraft fuel. There are signs, however, that the situation may improve as recently a patent was issued for what is in effect the use of nitromethane as a jet propulsion fuel. In this case the invention is ingeniously—and correctly—presented as "a method of producing hot gases under pressure which comprises injecting the nitromethane into the combustion chamber and igniting it." The real feature of the invention incidentally is the use of a

catalytic lining on the combustion chamber which causes spontaneous ignition of the fuel. An interesting patent on the same lines proposes the use of nitromethane, as an oxygen carrier, blended with a combustible such as nitrobenzene in suitable proportions as a fuel for submarines and torpedoes with a view to reducing the weight of fuel and oxygen carrier to a minimum. The chief interest of this patent, which is in the name of a German inventor, is its date, November 1, 1905.

We now come to this question of the manner of manufacture being new. The reason behind this requirement is obvious in that if the inventor provides as his share of the bargain something that was known already it is ridiculous that he should get a monoply for it and be in a position to stop others from doing what they have already been doing, maybe for years. This is just what happened under the old monopoly system. Closely bound up with this question of abstract novelty is the matter of patentable novelty, or "subject matter," as it is called. Many things may technically be "manners of new manufacture" but may be very obvious. For example, if it is known to put a teacosy on a teapot it does not take much inventive ingenuity to put one on a coffee pot. At the same time it imposes a great burden on Patent Office staffs to expect them to be familiar with all the publications throughout the world in a given technical sphere and still more so to expect them also to give a judicial opinion on whether a given invention has inventive subject matter over what is known. For this reason different types of examination procedure have grown up in the Patent Offices of various countries. One extreme is in France where the Patent Application is merely lodged. No question of novelty or subject matter is raised unless or until the Patent appears in Court when the whole business is thrashed out. At the other extreme come the United States and Holland and, before the war, Germany, where the invention is examined very severely for novelty and also for subject matter. In other words the Examiner has to be convinced not only that the invention is new but also that it is surprisingly new and not obvious. In England, not unexpectedly, a compromise procedure is followed in which the Examiner can object that the invention is not novel or is not a manner of manufacture but can do nothing at all about subject matter. There is a lot of argument about whether this is a good thing or not, but in the author's view it is. It is extremely easy to be wise after the event and when someone puts forward a really simple solution to a problem which has been unsolved for years to say "Oh well, that's quite obvious." It is often the simplest inventions which are the best, and those are the very ones which are most likely to be condemned for being obvious. The 1949 Patents Act, under which we are now working, has introduced as a new ground for opposition, that the invention is clearly obvious. Thus the British Patent Office can now, for the first time, consider subject matter, but only if it is raised in opposition proceedings.

Before going any deeper into the current Examination procedure at the Patent Office we might go back into the past again and find out how the present practice grew up. In the early days all that the inventor provided was the title of his invention and this was frequently not very illuminating, although it might be tantalizing, as in Patent No. 4/1617 which was for a "certayne oyle or composicion of oyles wherewith to keep armors and armes from rust canker or the like meanes of peryshings or decaye, farre exceeding the ordinary wayes now or heretofore used in that behalf." That was all. This system turned out to have disadvantages on both sides. On the one hand the public had no information about the invention when the patent had expired, and on the

other hand the inventor had no proof of what was his invention if he wished to claim his protection and sue someone for infringing his patent. Accordingly the custom grew up, and was eventually made law, of filing a "Specification" with a Patent Application. This contained a description of the invention and all the relevant information that the inventor had to give the public, so that anyone could freely and easily work the invention after the expiry of the patent. This still left the inventor without any clear proof of what, in his opinion, would or would not constitute infringement of his patent, so the further practice grew up, and was also made law in due course, of defining the scope of the monopoly protection asked for in a so-called statement of claims.

Later will be considered the Patent Specification as a source of information, and for this purpose the claim is of little significance. During the life of the patent, however, both to the patentee and to his potential competitors, the claims are by far the most important part of the patent. No matter what may be described in the Specification, the claim, and the claim only, defines the monopoly covered. If it is too wide the patent is invalid. If it is too narrow the patent is easily avoided, while still taking the benefit of the invention. Particularly in chemical cases the drafting of good valid claims is a matter of great difficulty and the patentee is nearly always the loser. Witness the remark made by a member of the U.S. Supreme Court not so very long ago. "The only valid patent in this country is one which has not been brought before this Court."

Many people seem to regard the big business monopolist and the crank inventor as the main customers of the Patent Office. No doubt the crank inventor does exist, but in a very small minority. Most of the inventors whose names are household words—Stevenson, Edison, Marconi and so forth—have recorded their ideas in the form of patents. Then there are big research organizations who file large numbers of patents virtually publishing a continuing report of their operations in patent specifications. With so much good material and so very much useful routine material about, there is not much room for the crank. In any case the sum total of technical information available in all the patent specifications on a given subject is a wealth of knowledge probably without parallel anywhere else.

A brief indication will now be given of the normal procedure for preparing and filing a patent Application. An Application Form is deposited at the Patent Office and with it a Specification, either Complete or Provisional. The Provisional is just what its name implies and gives one the right to file a Complete Specification within 12 months, although a Complete Specification may be filed right away.

In the specification the introduction states what the invention is about. The problem to be solved is then generally set forth, and earlier unsuccessful attempts at its solution may be described.

The object of the invention having been thus set out it is then described as broadly as possible, concluding with a description of the preferred embodiment and any other relevant details. The Complete Specification is fuller than the Provisional and should contain a detailed description of at least one practical application of the invention, for example, a drawing and description of a machine or apparatus or a description of several actual runs made on a new chemical process. Then follows the statement of claim to which reference has already been made. To be valid the claim must not be wider than is justified by the description or as someone or other once put it: "the grant must not exceed the consideration." If it is too narrow, however, anyone "skilled in the art" (another piece of patent jargon) can read the Specification and the claim and

see easily how he can take full advantage of the inventive idea without infringing the regrettably narrow claim.

The stage has now been reached where the Complete Specification is in the Patent Office. It is read over by an Examiner, who makes a search in British Patent Specifications up to 50 years old and in any other literature as he feels inclined, for what are termed "anticipations" or "citations." He then sends the inventor a letter in which he makes a number of objections to his specification, formal, technical and, much the most important, citations of "prior art." These citations are considered by the inventor, who either argues that they do not show his invention, or he narrows the scope of his claim so that it no longer includes within it what is old, but only that new contribution which is his own.

In due course he will have satisfied the Examiner and his Application will be "accepted" and printed. After that anyone with good grounds can oppose the grant of a patent to him for various reasons, the most important of which is the production of "prior art" not cited by the Examiner. Assuming that he is not opposed, the patent is then sealed and he has the right to sue for infringement anyone who is operating a process which falls within the scope of his claim. It should be borne in mind that the inventor himself may be debarred from using his own process by the existence of an earlier and wider patent.

Returning to the subject of drafting Specifications, the Provisional, although generally shorter than the Complete, should contain an adequate description of the invention. In the author's opinion one which consisted solely of the five words, "petroleum oil, acetic acid, soap" erred on the side of terseness. It turned out to be for a paint cleaner. The main difficulty that people who are unfamiliar with patent matters seem to have, however, lies in the Claims. In principle, there is no great difficulty. For example, in the invention just mentioned the Claim could read "A paint-cleansing composition comprising a mixture of petroleum oil, acetic acid and soap." It is not a very good claim for various reasons but at least it is clear that if anyone makes a mixture of these things and sells or uses it, he will be infringing. If the claim read: "60-70 per cent oil, 10-20 per cent acetic acid and the remainder soap," it would be a narrower and probably more valid claim.

The first form of error in claim drafting into which some amateur inventors fall is the financial one in which they claim sums of money whose size varies with their own estimation of the importance of their invention and the degree of optimism in their make up. Quoting the (now obsolete) end of the specification "Having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed, I declare that what I claim is:—one thousand pounds"! No patent with such a claim has, of course, ever been issued by the Patent Office, but it is likely that quite a number have been submitted to them.

There is one patent claim for whose inclusion in this paper no excuse can be found other than the fact that the Specification is a good example of the kind in which you can almost see the inventor at work making his invention. The patent is dated 1895—picture the inventor in a violent storm having considerable difficulties with his umbrella which is blown inside out and back again. The flash of inspiration comes and he files his application for his invention. It consists, in principle, of an ordinary umbrella, but without any retaining catches so that in his own words "it can plunge backwards and forwards." This is how he describes it. "A contracting and expanding propeller for lifting and steering flying machines, for propelling boats, barges and yachts and other vessels and for steering, for

ventilating mines, ships, rooms, passages, and wells for pumping, swimming, and as an umbrella." His claim is: "that the whole of the apparatus here described and illustrated is my invention and that I require a patent for the same for which I shall ever feel grateful."

Another example of an eccentric claim in the same year was for an invention that consisted of putting a mixture of tidal and river sand with salt on football grounds to keep them free from frost. In the event of a thaw the mixture becomes a manure which does not seem to be in accordance with the normal effect of putting salt on grass. Anyway this doubt is dispelled by the claim which reads: "That this invention has been tested on the Leeds Parish Church, Bradford and Halifax football grounds and proved a great success in frosty weather."

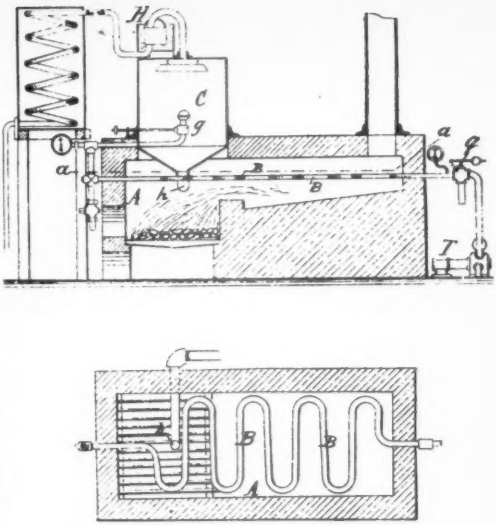


Fig. 2. B.P. 1922/1887 (George L. Benton). Pipe still.

The stage has now been reached where the patent has been granted and the right has been gained to sue anyone who infringes the claim. Now the spectre of "abuse of monopoly" returns. Every so often there is a spate of correspondence in the Press about the shortcomings of some of the larger industries in using patent blocks to suppress competition and deprive the public of improved articles at lower cost. In so far as it is safe to generalize about anything, it is safe to say that this is sheer nonsense. After a patent has expired anyone may use the patented process. By keeping up a steady development programme and maintaining a patent position in advance of competition, a company may be able to retain an effective monopoly in its field, but this is the result of its own enterprise and not of the abuse of patent monopoly. In general the inventions which give rise to fuss about suppression are rejected by industry either because they are just crack-brained or because they are not economic.

A few facts are relevant here. The life of a patent is sixteen years, but this is dependent on paying renewal fees from the fifth year onwards, the size of the fee being the same as the number of years in pounds. The result of this is that most British patents last five years only. A reasonable number struggle on to eight years or so but very very few last the full term of sixteen years. Another fact is that for a long time past the Patents Acts have contained specific clauses intended to deal with abuse of monopoly. These have very rarely been invoked. At the moment we are operating under the Patents Act, 1949. This is the first time the Act has been completely redrafted since 1907 and is the result of the work of a Royal Commission presided over by Sir Kenneth Swan. As Royal Commissions go this was rather

unusual in that it sat for a fairly short time, issued two excellent reports and postive action was taken on its reports forthwith. One of the matters which it had to consider specifically was the question of abuse of monopoly and, in its findings, it stated that it had found no trace of it.

One example of so-called "monopoly" concerns the so-called "everlasting match." In the view of its supporters this is just what the name indicates and has been ruthlessly suppressed by the match interests for the fairly obvious reason that once everyone was equipped with an everlasting match (and maybe one spare), their business would dwindle away. If the Laws of Conservation of Energy and of Matter are ignored this seems a not unreasonable thesis. Anyway, when the argument last burst forth in the correspondence columns of *The Times* just after the war, the writer was working with a firm of Patent Agents who had a client who was very alert on patent matters and scented a chance of making some money. He realized that some of these everlasting match patents must have run out and that if they were as good as they were made out to be, this was his chance to set up in business against the big match companies. We did a search for him and it came as rather an anticlimax to find that these matches were really sticks of slow-burning firework-like mixture impregnated with striking material like an ordinary match, but so slow-burning that when struck they burnt with a gentle glow and could be blown out and restruck a number of times. We were not unduly surprised that he did not go into competition with the match industry but would emphasize that he would have had no difficulty or hesitation in so doing if it had been worth while.

Some consideration will now be given to the point of view of the public in considering the Patent Specification as a source of technical information—frequently of a rather obscure nature, and to do this a quick look may be taken at the oil industry.

For practical purposes it can be reckoned that the oil industry is just about 100 years old, the British patents of James Young in the 1850's and 60's, together with the drilling of Drake's well in America in 1859, roughly marking the beginning of the present era.

Young, apart from working with Derby petroleum, was concerned with the recovery of oil by the distillation of bituminous coal and was really the founder of the Scottish shale oil industry. His process was a straightforward distillation with superheated steam (Fig. 1). This in fact was very similar to that of a much earlier but less publicized patent to the Earl of Dundonald in 1781. This covered a method of "extracting tar, pitch, oil, alkali, etc. from pit coal"—by admitting a limited amount of air to a closed vessel with coal in it—"by which means the coals, after being kindled, are enabled by their own heat without the assistance of any other fire to throw off in distillation or vapour the tar, oil, acids, alkalies and salts they contain into receivers or condensing vessels." Steam may be added to the distillation and the condensation accelerated with cold water. Unlike quite a number of inventions which are ahead of their time, this seems to have been recognized at its true value at the time, since the patent was extended for 20 years by Act of Parliament.

Going back still further into the past, the point made earlier about the nuisance of having no Specification can be illustrated by reference to No. 330/1694 which was for "a waye to extract and make great quantities of pitch, tarre and oyle out of a sort of stone." Unfortunately there is no description either of how to do it or of what stone is used.

In the United States the interest was naturally primarily concerned with petroleum and for some time the procedure

consisted of getting the oil out of the ground and fractionating it to recover a fraction suitable for lamp oil. There is a plausible theory that the basic stimulus which caused the oil industry to arise was the shortage of whale oil which had previously been used for lamps, this being due to the reluctance of the sperm whale to breed for the major purpose of brightening the life of the human race, and its near disappearance in the early nineteenth century.

Nevertheless, coal oil had been used extensively in the U.S. also for lamp oil and a patent was granted to Abraham Cesner in 1846 for a coal distillation process. In the period 1852-9 there were some 60 coal distillation plants in the U.S., most of which were converted to oil after Drake's well was drilled.

The petroleum was distilled to recover burning oil, gasoline being regarded as a dangerous nuisance. The first records of the deliberate distillation of petroleum seem to have been in Russia in 1735, but it is generally accepted that the first refinery proper was set up in Titusville, Pa., in 1850. It cost $15,000 which nowadays is a sobering thought. In the same year the first practicable patents for continuous distillation was issued in the U.S. to Stombs and Brace and this practice rapidly replaced the conventional batch distillation. Fig. 2 shows an early pipe still. Cracking to increase the yield of light distillate was discovered by accident in the following year, when a still attendant stoked up a half run 16-barrel still and left it for what was meant to be one hour, but, for some unexplained reason, turned out to be four. When he returned, instead of the chaos he expected, he found a fabulous yield of distillate.

The patent structure on cracking, both thermal and catalytic is highly complex and the numbers must run into thousands and are still growing. They interlock and overlap in a fantastic manner and this is not the place to enter into a discussion on them.

To return to the United Kingdom, however, Patent No. 170/1855 to William Kilgour, shows that petroleum was not an American monopoly, related to the recovery of naphtha, paraffin, and paraffine oil from "earth oil from the Burman Empire." The earth oil had the consistency of treacle to soft butter, was clarified at 100-200°F, distilled to recover naphtha and then the wax and paraffine oil separated either by distillation or by cooling and expressing through cloth bags. The products

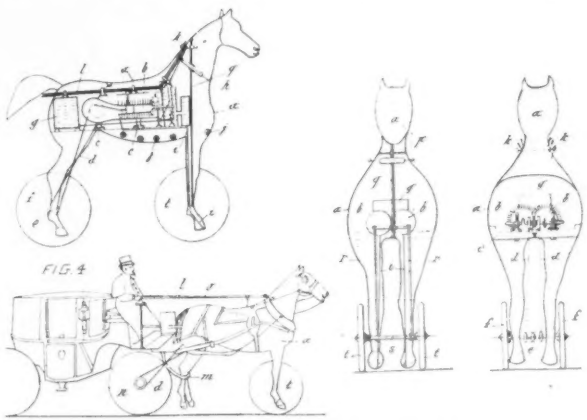


Fig. 3. B.P. No. 7027/1899. Auto-motor horse.

could, if necessary, be refined with sulphuric acid, neutralized and re-run.

A few more modern illustrative patents on motor fuels will now be mentioned, with an occasional divergence into the vehicles in which they are used,

It is proposed, since conventional methods for producing gasoline are well known, to describe some of the more unusual proposals which have been put forward, and which are unlikely to be found in any of the standard textbooks. All of these major processes, cracking, hydroforming, reforming, isomerization, polymerization, alkylation and so forth are, or were, covered by patent structures, and patents of this type make up the majority of those in this field. The patents are, or were, of considerable value—for example the Ethyl gasoline patents earned directly or indirectly some £20 million per year throughout their life—and the last thing which it is desired to do is to give the impression that the average patent is of the nature of some of those to be described. On the contrary, they were only picked out after diligent searching. Furthermore, some of them may work very well and be in successful use. They are not mentioned in a spirit of technical criticism, therefore, but because they have a certain interest.

A fairly unconventional fuel blend was patented in 1920 and consisted of a mixture of alcohol, such as brandy, with carbon disulphide which had been pretreated with lime. This pretreatment prevented separation of the components which one cannot help regarding as rather a pity. It is curious how inventors seem to like maltreating brandy, as the same composition without the pretreatment had been proposed some 15 to 20 years earlier, and about the same time another inventor produced a consumption cure which was made by infusing garlic in brandy for a week or ten days.

Several additives have been proposed to increase the explosive power of ordinary petrol. These include the ignition compound from the ends of matches (1928) and a few years later, in a more progressive spirit, high explosives such as nitroglycerine and TNT.

In a more peaceful vein, a very large and eminent organization obtained a patent in 1932 based on the observation that the smell from the average car exhaust was not pleasant. They proposed to overcome this by the addition to the fuel of artificial musk and other fragrant and strong-smelling materials which were not burnt in the combustion chamber. It is believed that this actually works, and it conjures up a pleasing picture of an exotic haze hanging over the Strand in the middle of the day and even different branded gasolines being identified by the characteristic fragrance they leave behind.

An interesting wartime patent of French origin and based, of course, on the shortage over there of hydrocarbon fuels related to the use of liquid ammonia as a motor fuel. This has disadvantages apart from the obvious ones, principally its low calorific value and its difficult combustibility. These are overcome, according to the invention, by the addition of up to 20 per cent of acetylene.

Two other patents on fuel compositions may fairly be described as being of the eccentric invention type. Their dates are comparatively modern, 1937 and 1942 respectively. It is very difficult to describe the procedure in the space available and it is better to quote the official Patent Office abridgement of the Specification, with a few preliminary remarks on how to make "grass oil" which is one of the ingredients.

"Grass and waste vegetable matter is allowed to decompose for six weeks or so in plenty of water containing some dichlorethylene and acetone. Chalk lime is added and the decomposed vegetation filtered off and to the liquid is added more dichlorethylene and acetone, methylated spirit and chalk lime."

Fig. 4. B.P. No. 7027/1899. Auto-motor horse.

This liquid is grass-oil. Now follows the official abridgement:

"Motor spirit is prepared by mixing with petrol two liquids A and B prepared as follows:—There are mixed *p*-dichlorbenzene ether, acetone, lead acetate, the distillate from grass oil, benzine and zinc sulphate solution and the oily layer is removed. To the remaining aqueous liquid are added the liquid drained from decomposing citrus fruit peels, acetone, grass oil, petrol and ether and the oily layer "O" is separated. To the aqueous layer is added *o*-phosphoric acid solution, *p*-dichlorbenzene, acetone, ether, dichlorethylene, fusel oil and benzine, and the mixture is distilled. To the distillate is added dichlorethylene, fusel oil, acetone, ether, sodium carbonate, and ammonia solution, and this mixture is distilled, the distillate being rejected and there being added to the residue benzine and petrol. The distillate from this liquid is mixed with the oil "O" (just referred to) to constitute liquid A.

"To some grass oil is added dichlorethylene, phosphoric acid, acetone and methylated spirit, the liquid filtered over lime and more methylated spirit added. The mixture is distilled: to the distillate is added acetone, fusel oil, ether and dichlorethylene and methylated spirit. This mixture is distilled and to the distillate are added benzine, acetone and fusel oil constituting liquid B.

"Equal parts of A and B are mixed with gasoline. The product evidently has a strong smell of acetylene which may be masked by the addition of a third liquid prepared as follows:—turpentine is heated with wood ash or charcoal and on cooling sulphuric acid is added followed by a liquid prepared by heating with HCl, the liquid draining from decomposing citrus fruit peels and water. The oily layer is removed, mixed with methylated spirit, dichlorethylene, fusel oil and acetone and distilled. The fragrant distillate is then added in an appropriate amount to the motor fuel blend."

There are several other patents about the same date and on the same lines by this inventor as well as the later one of 1942. This one is rather less complicated than its predecessors. Coal tar is mixed with alcohol, benzene, and kerosine and distilled. The watery layer from the distillate is put back with the still residue and mixed with naphthalene, sodium nitrate, anhydrous hydrochloric, nitric and sulphuric acids and resin, and distilled. The mechanical procedure is fairly conventional, but the products sound interesting. The distillates obtained in various stages change in colour from black to brown, and then to green and pink and at one stage a solid material which looks like diamonds, but is soft to the touch is left. The particularly agreeable product is one of the examples is a brownish oil which burns with a red, white and blue flame giving off sparks as it does so.

Some consideration should now be given to the more unusual developments which might have taken place in the vehicles in which fuels are used, had things turned out differently.

One highly unconventional vessel was patented in 1864. It consisted of an iron sphere about 50 ft in diameter with

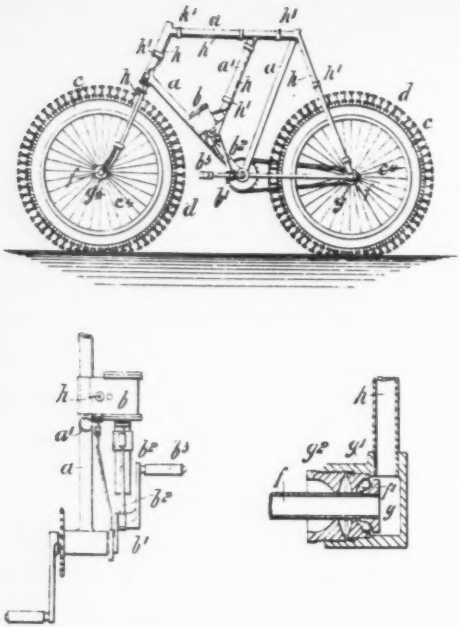


Fig. 5. B.P. No. 12,533/1887. Improved bicycle.

a central axis on which was slung a boat or other vessel for passengers. A suitable engine caused the axle to rotate and propel the vessel. Its primary purpose was for travelling on water but the inventor pointed out that it was also useful on sandy deserts.

Another intriguing invention was a coupling device for attaching a bath chair onto a motor cycle. From the specification it appeared that previous devices had not been satisfactory, but even this one, although mechanically very good, suffered from what appears to be an overwhelming defect, namely the absence of any quick release device for the unfortunate occupant of the bath chair.

It is an inescapable fact that the most important mechanical development which has grown up with the oil industry is the automobile. Looking at the history of its development from the early "horseless carriage" to the remarkable monsters of the present day, the type of progress seems inevitable and it is difficult to visualize any alternative route. Nevertheless if one early inventor had his way, things would have been different. He lamented the passing of the horse, and his compromise answer to the threat of the horseless carriage is shown in the Fig. 3. His horse is made with an internal combustion engine inside it and the controls come out of the neck from which they can conveniently be manipulated by reins as shown in the practical application of the invention to the carriage. This application of the I.C. engine has an advantage not possessed by its contemporary, the "horseless carriage" as indicated by Figure 4, which really needs no explanation.

The patent literature is a magnificent source of information, particularly on obscure and detailed points and serves a purpose which cannot be fulfilled by any textbook; likewise the reverse is true and textbooks cannot be replaced by masses of patents. One advantage of the patent literature as a source of information, however, is the great width of the classes in which the patents are classified. The mechanical horse just mentioned came out of the class of road vehicles in which he was rubbing shoulders with cars, carriages, bicycles, velocipedes, scooters, handcarts and an enormous variety of other things. In fact, very near him, was an exceptionally charming bicycle shown in Fig. 5. The tyres are made of steel and the little studs sticking out all round the wheels are the plungers of small pumps. As

you go along air is pumped into the tyre which acts as a reservoir and communicates with the hub through a hollow spoke. From the hub the air passes through the frame and drives a compressed air engine which, in turn, drives the back wheel, The patent has been dead for a long time now and if anyone should wish to modify his bicycle along these lines he is absolutely free to do so.

There are several other mildly entertaining patents, such as the one dated 1945 for a rust-preventive coating composition made of parsnip juice, vegetable black, glue and powdered glass. The main purpose of this paper has been to show that the Patent system has an excellent twofold purpose. On the one hand it enables the inventor to protect his brain-children against the piracy of others who have not the wit to think up things for themselves. On the other hand it provides the public with a steady accumulation of technological information, some of it elementary, some of it nonsensical but a very large amount of it of very real value to the seeker after knowledge.

★ ★ ★

OIL FIRING OF NON-FERROUS METALLURGICAL FURNACES

A reprint of an article by M. Roddan, M.Inst.Pet., M.Inst.F., which appeared in *Metal Treatment and Drop Forging* is available from Shell-Mex and B.P. Ltd.

The article is based on a lecture to the South Wales Local Section of the Institute of Metals. A plea for closer attention to fuel consumption and efficiency of burning is made by the author, who discusses the application of fuel-oil firing for non-ferrous melting furnaces. The types of oil and their important features are described, as well as some of the various oil-fired furnaces available to the non-ferrous industry.

U.K. OIL REFINING TRADE

Preliminary Report No. 154 (Board of Trade Journal, July 7, 1951) of the Census of Production 1948 relates to establishments wholly or mainly engaged in refining and distillation of petroleum and crude shale oil, and which employed more than ten persons on the average during the year. The figures are summarized in Table I:—

Table I—General Summary

	1948	1935
	£'000	£'000
Value of production (gross output)	42,489*	7,768
Cost of materials, fuel and electricity used	34,973	4,730
Excise duty	341	†
Net output	7,175	3,038
Wages and salaries of persons employed	2,953	—
	No.	No.
Average number of persons employed	7,773	3,387
	£	£
Net output per person employed	923	897
	No.	No.
Number of establishments ...	16	20

* Derived as follows: sales, £40,544,000; stocks and work in progress, £1,945,000.
† Included in cost of materials, etc.

Capital expenditure in 1948 was £3,478,000 on new and £1,524,000 on second-hand plant and machinery, and £51,000 on new and £29,000 on second-hand vehicles. Plant to the value of £20,000 and vehicles valued at £1,000 were disposed of during the year. Of the 7,773 workers in 1948, 572 were females 83 of whom were employed as operatives.

★ ★ ★

Delayed Coking. The new delayed-coking unit at Pan Am Southern Corporation's El Dorado, Arkansas, refinery is described and illustrated in a booklet entitled "New Horizons" just issued by the Lummus Company. Copies are obtainable from 385 Madison Avenue, New York 17, N.Y.

HERIOT-WATT FELLOWSHIPS

The Governors of the Heriot-Watt College, Edinburgh, have recently instituted a new award—the Fellowship of the College. Designed primarily to encourage original work in those branches of study at present recognized for the Associateship of the College, the Governors also have powers to confer the Honorary Fellowship on those distinguished in science or engineering who have a connexion with the College or who have performed meritorious service for the college.

On July 10 the Honorary Fellowship was conferred upon twenty-five old students or former members of the staff and governors, the ceremony being performed by the Lord Provost of the City of Edinburgh. Among those so honoured were:—

John M. Caldwell, J.P., A.H-W.C., M.I.Min.E., M.Inst.Pet., who gained the Associateship in Mining Engineering (1922) and in Oil Mining (1923). He served his apprenticeship with the Pumpherston Oil Co, was appointed general mining manager of Scottish Oils Ltd in 1946, and in 1948 was promoted to his present post of general manager of the same company.

Peter Kerr, A.H-W.C., M.A., B.Sc., F.R.I.C., F.Inst.Pet., who took his Associateship in Applied Chemistry in 1913. Following post-graduate work at King's College, London, he worked on explosives and gases at Woolwich Arsenal until he joined the Shell organization in 1919. He was at various times in charge of the Central Laboratories, of refineries in Britain and in the Far East, and of oil measurement, until his retirement in 1946. Since that date he has been technical secretary to the Institute of Petroleum.

Willison B. Peutherer, A.H-W.C., Ph.D., F.R.I.C., F.Inst.Pet., took the Associateship in 1927 in Applied Chemistry, specializing in oil technology, and for a time acted as evening class demonstrator in the Chemistry Department. From 1938 to 1941 he carried out research at the College and at the Pumpherston refinery on paraffin wax treatment, for which he gained the Ph.D. of Edinburgh University. He joined Scottish Oils Ltd in 1927 and now holds the important post of manager of the Grangemouth refinery.

★ ★ ★

Iranian Oil and South-east Asia. The position of Iran as a supplier of petroleum products to India, Pakistan, Ceylon, and Malaya is discussed in an article by V. Wolpert in the July issue of *Eastern World.*

Jointings. A 20-page illustrated booklet gives specifications of the range of compressed asbestos fibre jointings manufactured by Richard Klinger, Ltd, Sidcup, Kent. It also includes charts of resilience and compressibility.

MODERN TECHNIQUES IN PETROLEUM TESTING

II. SPECTROMETRY IN THE PETROLEUM INDUSTRY

By L. K. MALTBY*

Introduction

In the past decade spectrometric methods of analysis have been applied intensively to industrial problems and the petroleum industry has played a notable part in the development of this branch of science to an industrial analytical level.

The purpose of this article, therefore, is to attempt to indicate how spectrometry is being utilized for analytical work in the petroleum industry and to give a brief indication of the basic principles involved in each of its different branches, the "family tree" of which is shown in Fig. 1. The mass spectrometer has been included as it is usually regarded from the analytical viewpoint as a piece of spectrometric equipment.

Emission Spectrometry

Emission spectrometry depends on the radiation emitted when a material is excited electrically or by heating to incandescence. The radiation so obtained is characteristic of the atoms which form the molecule of the material and not of the molecule as a whole, so by the examination of this radiation we have a convenient means of determining the metallic constituents of materials. This type of analysis is known as spectrochemical analysis and its main applications to the petroleum industry are the determination of metallic constituents of crude oils, used and unused lubricating oils, sludges, engine deposits, greases and catalysts.

The essential features of an instrument suitable for emission spectrometry are shown in Fig. 2. These are :—

1. *An electrode system across which an arc or spark may be struck, the sample in general being supported on the bottom electrode.*

2. *An optical system for concentrating the radiation into the spectrograph.*

3. *A quartz or glass prism with an associated lens system which breaks up the beam of radiation into its component wave lengths.*

4. *A camera attachment for photographing the spectrum, which consists of a large number of well defined vertical lines.*

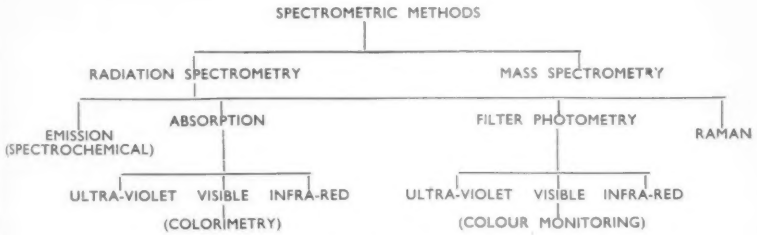


Fig. 1. Classification of Spectrometric Methods.

*Anglo-Iranian Oil Co Ltd.

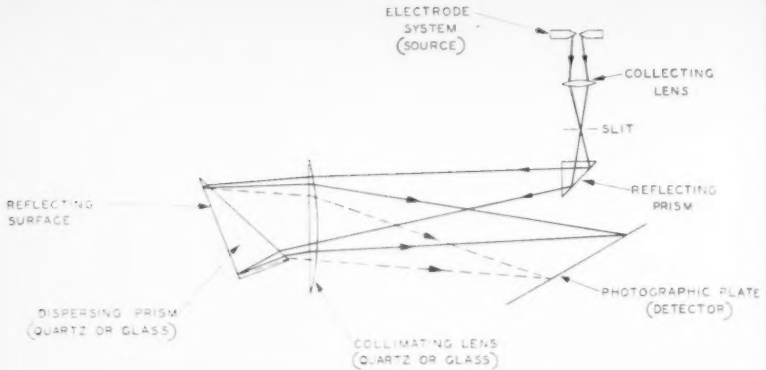


Fig. 2. Diagram of Emission Spectrometer.

The number of the lines and their positions on the wavelength scale are dependent on the elements which are present and are characteristic of them, so that qualitative spectrochemical analysis merely involves an interpretation of the photographic plate with reference to the positions of the spectrum lines on the wavelength scale.

For quantitative work, however, the intensities or blackness of the lines must be measured, the intensity of a line due to a particular element being in general proportional to the amount of that element present in the sample being analysed. However, the intensity or blackness of the line depends not only on the amount of element present but also on the method adopted for the "burning" of the sample, the chemical constitution of the material and the photographic developing process employed. Nevertheless, it is possible to obtain results at least comparable with the chemical methods, provided that each feature of the procedure is standardized as far as possible. In fact using I.P. 122 (T), which has been recently introduced, about 20 elements may be determined in a few hours, with an accuracy of about 20 per cent of the amount of each element present, by visual inspection of the photographic plate. If greater accuracy is required it can be obtained by using a microphotometer to measure the intensity or blackness of the lines.

It has never been claimed that spectrochemical methods give better accuracy than that obtained by chemical methods for inorganic elements present in concentrations greater than 1 per cent, but they are superior to all other methods for those constituents which are present in small traces. The real advantage, however, lies in the saving in time of analysis, particularly if the concentrations of a number of elements in the sample are required, and also in the speed with which a qualitative analysis may be performed as a preliminary to a detailed quantitative analysis by either chemical or spectrochemical methods.

Absorption Spectrometry

(a) General

Absorption spectrometry is concerned with the qualitative, quantitative, and structural analysis of molecules. It may be regarded as the opposite of emission spectrometry in that measurements are made of radiation absorbed instead of emitted. The sample is placed in a beam of ultra-violet, visible or infra-red radiation, some of which is absorbed and some transmitted. The wavelengths at which the absorption takes place and the

extent of the absorption are governed by the molecular structure of the sample and it is this selective absorption which enables absorption spectrometry to be used for analytical work.

The work carried out in the visible region of the spectrum and commonly known as colorimetry forms a subject on its own and it is therefore not dealt with in this article.

(b) Ultra-Violet

The layout of a typical instrument for the measurement of absorption of ultra-violet radiation is shown diagrammatically in Fig. 3. Here ultra-violet light from a hydrogen lamp is directed by an optical system into the spectrometer and is passed through a quartz prism thus being broken up into its constituent wave lengths. The appropriate wave length is selected by rotating the prism and the radiation is then passed in turn through two quartz absorption cells, one filled with a solution of the sample in a non-absorbing solvent and the other filled with the solvent only, to compensate for the small amount of absorption due to the quartz.

The amount of radiation absorbed by the sample is determined by means of a photocell-potentiometer system at wavelengths characteristic of the known components of the mixture. The result is calculated from the relationship between the sample absorption and the known absorption characteristics of the pure components.

Only certain types of substances absorb ultra-violet radiation. Of the hydrocarbons only aromatics and certain types of unsaturated compounds show characteristic absorption, whereas the saturated hydrocarbons such as paraffins and naphthenes may be regarded as being completely transparent. Because of this, ultra-violet absorption offers a very convenient method for the estimation of aromatics. The individual aromatics up to and including the xylenes can be handled very rapidly and usually less than 1 g of sample is required for analysis. An interesting example of the use of an aromatic material as a tracer is found in an ultra-violet absorption method for the determination of oil in wax which was developed in the laboratories of the Standard Oil Development Co. This method is based on the fact that, due to the aromatics it contains, the oil absorbs ultra-violet radiation while the wax is transparent in this region of the spectrum.

In the field of gas analysis, butadiene may conveniently be determined by

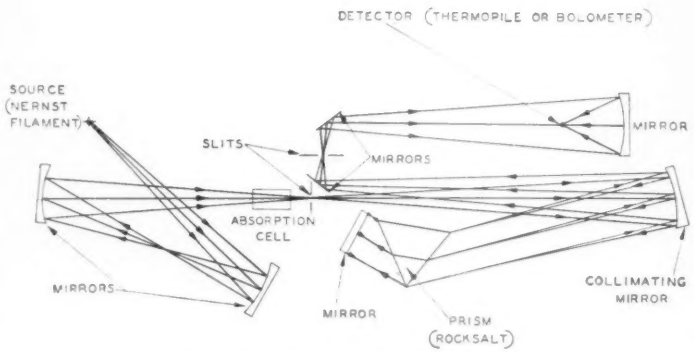


Fig. 3. Diagram of Infra-Red Spectrometer.

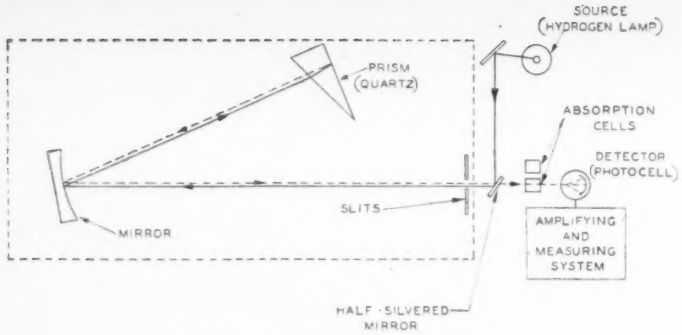


Fig. 4. Diagram of Ultra-Violet Spectrometer.

an ultra-violet method, the accuracy of the results being at least as good as that obtained by the conventional chemical absorption procedure. The time of a single analysis is about half-an-hour and the amount of sample required is extremely small.

Ultra-violet methods may also be used for the analysis of non-hydrocarbons provided that some form of characteristic absorption occurs. A good example of this is the analysis of a dewaxing solvent which is a mixture of methyl ethyl ketone, benzene and toluene. Here the spectroscopic method merely involves the measurement of the absorption of the sample suitably diluted in non-absorbing solvent at three wavelengths in the ultra-violet region and gives a result with satisfactory accuracy in approximately half-an-hour as compared with three hours by an extraction and cloud point method.

(*c*) *Infra-Red*

For most general infra-red absorption work, the source of radiation is a Nernst filament and the prism is made of rock-salt, which breaks up the beam of infra-red radiation into its component wavelengths. The radiation, which may be regarded in this case as heat rays, cannot be recorded photographically and is therefore directed to a thermopile or bolometer (instruments designed to measure small quantities of radiant heat). Fig. 4 shows a typical layout for an infra-red spectrometer.

All hydrocarbons and organic materials absorb infra-red radiation and as the frequencies (or wavelengths) absorbed depend upon the structure of the molecules in the path of the radiation, the infra-red spectrum of a compound is a unique pattern or "fingerprint" characteristic of that material. Owing to the very high absorption which occurs and as solvents are not normally used for the infra-red examination of hydrocarbons as they themselves absorb in this region, the absorbing path length must be extremely small (0·05–0·2 mm). The calculations required for the analysis are very similar to those of the ultra-violet procedure, the thermopile measurements of course taking the place of the measurement of absorption by the photocell potentiometer system of the ultra-violet method.

The most important use which has been made of infra-red spectroscopy in the petroleum industry is in the field of hydrocarbon gas analysis and although the mass spectrometer is being generally accepted as the most suitable instrument for analysing mixtures containing a large number of components, the infra-red spectrometer has still a useful

contribution to make to this particular problem. Hydrocarbon mixtures containing five or even six components can be analysed in less than an hour with an accuracy at least as good as that obtained by low-temperature fractionation.

Infra-red methods can therefore conveniently handle feeds and products of a number of refinery columns (e.g. depropanizers, debutanizers, etc.). Cracked C_4 fractions containing mixtures of the butene isomers (which cannot be accurately determined by means of the mass spectrometer) may also be analysed, though this is best done in conjunction with a rapid preliminary low temperature distillation, particularly when the sample is contaminated with C_3 and C_5 hydrocarbons.

Analyses of liquid hydrocarbon mixtures may also be performed. By suitable fractionation and infra-red examination of the fractions it is possible to determine the individual paraffins, naphthenes and aromatics boiling up to about 130°C. This is useful in evaluating the components present in the lower boiling range of crude oils and in testing products from various refinery processes, e.g. isomerization, alkylation, etc. Furthermore, by preliminary removal of the olefins, the paraffins and naphthenes boiling in this range in the products of cracking and reforming processes may be determined.

The number of olefins boiling above 50°C is so large and their spectra are so similar that complete individual analysis is impracticable. However it is possible to estimate the amounts of the various types of olefin present.

(d) Filter Photometry

Another instrument which is rapidly finding application in the refineries of the American petroleum industry is the filter photometer or continuous analyser. It is a non-dispersing instrument, that is to say, it does not first separate the radiation into its component wavelengths by means of a prism. Thus it does not allow of the measurement of absorption at each wavelength but rather integrates the absorption over a broad band of wavelengths which is selected by means of a filter (usually a cell containing the material which is to be determined). This type of instrument is simple and comparatively trouble free. It is less expensive than those already described and is well suited to the continuous examination and control of plant streams particularly if the concentration of a single component or molecular type in the stream is of interest.

Filter photometers may be designed to operate either in the ultra-violet or the infra-red region and due to their comparative simplicity, it is to be anticipated that use of these instruments will be greatly extended in the near future because the number of possible applications is very large.

Raman Spectrometry

To obtain the Raman spectrum the material is irradiated with monochromatic light, in other words with energy of only one frequency. Some of this energy is absorbed by the material and re-emitted and if the re-emitted portion is examined with a spectrometer it is found that while the majority is of the same frequency as the original exciting radiation, there is also a small amount of energy of quite different frequencies. Most of this "new" energy is concentrated into a number of bands whose frequency differences from the exciting radiation depend upon the molecular structure of the material being examined, as do infra-red absorption bands.

The information obtained from Raman spectra is therefore similar to that obtained from infra-red absorption spectra but the intensities with which the bands occur in the two spectra depend on different factors and it frequently happens that a band at a

particular frequency will be strong in the infra-red spectrum and weak in the Raman or vice versa. The two methods are therefore not competitive but complementary and, for some problems, if maximum analytical information is to be obtained, both types of spectra should be used.

Raman spectrometry can be of assistance in most hydrocarbon analytical work and it has been applied with particular success to the determination of olefin and aromatic hydrocarbons in distillates. It may also be used for the determination of total *cyclo*pentane and *cyclo*hexane derivatives, problems which cannot be handled satisfactorily by infra-red methods. Its chief disadvantage is that, compared with other spectrometric methods, a large amount of sample is required (usually 10–20 ml) which may cause serious difficulty from the point of view of the initial calibration with pure components.

Mass Spectrometry

The basic principles of the mass spectrometer differ completely from those of the previously-mentioned spectrometric methods in that they are not concerned with a region of the spectrum.

The sample in vapour form is bombarded by a beam of electrons and this results in some of the molecules of the sample being broken up into electrically charged fragments or ions which can be sorted according to their various masses by means of suitable electric and magnetic fields, a record of the relative numbers of ions of each mass being obtained. This record is known as the mass spectrum or "cracking pattern" and as in the case of infra-red and Raman spectrometry it is characteristic of the molecular structure of the material. This enables the mass spectrum of a mixture to be used for the determination of the components present, provided of course that the initial calibrations using pure materials have been made.

The most important application of the mass spectrometer in the petroleum industry is the analysis of hydrocarbon gas mixtures. Straight-run gas streams from refinery plants may be completely analysed in about 1½ hours and under certain conditions eighteen-component gas samples can be analysed in 2½ hours. There are certain limitations with regard to samples containing certain unsaturated hydrocarbons, but these samples can usually be analysed by a combination of mass and infra-red spectrometric techniques.

Conclusion

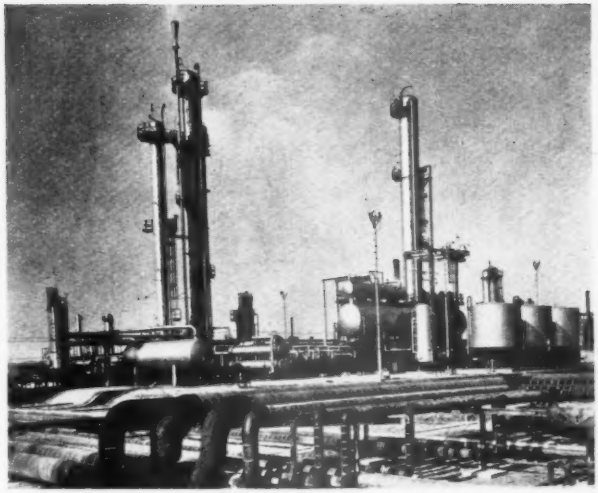
This paper has endeavoured to give a broad review of how spectrometry can be suitably and conveniently applied to analytical and control problems in the petroleum industry. It has been shown that each instrument has a broad range of usefulness and that in all the applications mentioned the use of spectrometric methods results in a saving in time as compared with the more conventional methods, where these exist. This saving in time is the particular virtue of spectrometric methods in general. There are some problems to which they offer the only solution and others in which they are of no assistance, but wherever a spectrometric method can be applied it is generally the most rapid method available.

Acknowledgment

The author wishes to thank the Chairman of the Anglo-Iranian Oil Co, for permission to submit this article.

★ ★ ★

The annual issue of *Svensk Sjofarts Tidning* (*Swedish Shipping Gazette*) gives details and some pictures of tankers launched or delivered from Swedish yards during 1951. It also contains an article on post-war developments in ship-building by A. C. Hardy, M.Inst.Pet., and on cargo and ballast distribution in tankers by T. Anderson.



A 2000-b.d. alkylation plant at the Barber refinery of California Refining Co., in Perth Amboy, New Jersey, designed and erected by the M.W. Kellogg Co.

★ ★ ★

PERSONAL NOTES

Consequent upon the retirement of Sir George Legh-Jones, F.Inst.Pet., as a managing director, **F. J. Stephens,** M.Inst.Pet., has been appointed a managing director of the Anglo-Saxon Petroleum Co Ltd, of the Shell Petroleum Co Ltd, and a delegate member of the Board of N.V. de Bataafsche Petroleum Mij, The Hague.

J. W. Martin, M.Inst.Pet., sales manager of Whessoe Ltd, has been appointed a director of the company. He will continue to be located in their London office.

G. W. Powell has been appointed deputy general sales manager of Esso Petroleum Co in succession to R. J. Pinder, M.Inst.Pet., who is now general sales manager. Esso's new assistant general sales manager is **W. H. Critchlow,** M.B.E., whose former post, that of manager of the London division, is now being filled by **H. W. L. Legg.**

Captain **Dudley Mason,** G.C., has succeeded **Captain J. T. Thomson** as marine superintendent of Eagle Oil and Shipping Co Ltd. Captain Mason began his career with the company 32 years ago. During the war, in the Malta convoy action of August 1942, he gained the first George Cross to be awarded to an officer in the Merchant Navy. Captain Thomson, who has retired, served 37 years with the company.

Another tanker fleet retirement is that of Senior Engineer **David Ewan,** O.B.E., who recently left the service of the Shell tanker fleet after 30 years with the company.

Russell J. Wolf has been named vice-president in charge of sales, and **Donald W. Champlin** vice-president in charge of manufacturing for the M. W. Kellogg Co.

Air Commodore **F. R. Banks,** C.B., O.B.E., F.Inst.Pet., has been re-elected a vice-president of the British Internal Combustion Engine Research Association for 1951-2.

SESSION 1951-2

An interesting series of papers has been arranged by the Papers Sub-Committee of the Institute of Petroleum for presentation at meetings of the Institute during the 1951-2 Session and the programme shows that there will be twelve Ordinary General Meetings and a Redwood Lecture. The Redwood Lecture will be delivered on October 3 by Professor F. H. Garner, O.B.E., and the subject will be "The Training of a Technologist."

For the opening meeting on September 19, the Institute has been fortunate in inducing Dr M. Muskat, Ph.D., Gulf Oil Corporation, to deliver a paper on "Our Unproduced Reserves: What are they?" in which he will discuss the unproduced oil reserves of the United States and the possibility of their being increased by more efficient methods of recovery.

On the geological and production sides of the industry, there are to be two papers, one on January 9 by E. Boaden, O.B.E., B.Sc., and E. C. Masterson, B.Sc., on "Some Aspects of Field Operations in Kuwait," while on May 14, Dr G. M. Lees, M.C., D.F.C., Ph.D., F.R.S., will contribute a paper on "The Distribution of the World's Oil Reserves."

On the important subject of Viscosity Index, F. T. Blott and C. G. Verver are discussing "Methods for Expressing the Viscosity-Temperature Relationships of Lubricating Oils" at a meeting on November 29 and this should prove of considerable interest.

Two symposia have been arranged, the first on "Acid Sludge; Its Utilization and Disposal" on October 10, being organized by J. S. Parker, and the second on February 13 dealing with "The Lubrication of Gears and the Testing of Gear Lubricants" being arranged by Dr C. G. Williams.

The utilization of petroleum products will be the subject of several papers. Thus on November 14, Dr S. F. Birch is to present a paper on "Detergents from Petroleum." On December 12, Professor Garner and his associates are to present a paper on "Pre-flame Reactions in a Diesel Engine," while on February 25, L. D. Derry, Dr E. B. Evans, and their colleagues will deal "Vapour and Air Release from with Aviation Fuels."

On the fuel question, the subject of "Alcohol Motor Fuels" will be ventilated on March 12, the "Economic Aspects" being presented by T. C. Owtram, M.B.E., and their "Manufacture and Uses" by S. J. W. Pleeth.

"Corrosion Problems in Engineering" will be the subject of a paper which Dr S. F. Dorey, C.B.E., D.Sc., F.R.S., will read on April 9 and on March 26, Dr C. C. Hall is to give a paper on "Comparison of 'Slurry,' Fluidized Bed, and Fixed Bed Operation in the Fischer-Tropsch Process."

★ ★ ★

CHEMISTRY OF OILS AND FATS

A series of twelve lectures on the recent chemistry of oils and fats commences at Acton Technical College on Friday, September 28 at 7.30 p.m. and will continue on successive Fridays. The course covers antioxidation of unsaturated fatty acids, polymerization, microanalytical methods of analysis, extraction and refining methods, and chemistry of drying oils. Fee for the course is £1 and registration forms are obtainable from the College, High Street, Acton, London, W.3.

★ ★ ★

Super-fractionation Apparatus. Under this title Griffin & Tatlock Ltd, Kemble Street, London, W.C.2, have published an illustrated booklet (GT 1385) describing laboratory fractionating columns in commercial production.

PETROLEUM IN PARLIAMENT

Barbados Prospecting

Asked on July 18 (1) whether His Majesty's Government accept the recommendations of the Lepper Report of 1949 on oil prospecting in Barbados; and what advice thereon was tendered to the Government of the Island; (2) why the British United Oil Company was offered only 22 per cent of the drillable area of Barbados after they had carried out extensive prospecting and survey; and why a foreign company, which had done none of the preliminary work, was offered the working of the rest of the island, the Secretary of State for the Colonies said: My predecessor informed the Barbados Government that he agreed with the recommendations in the Lepper Report, including the recommendation that, in view of their past operations, the British Union Oil Company should be granted a prospecting licence over the whole of the Island.

The Barbados Government decided, however, that it was not in the best interests of the territory to grant a monopoly to the British Union Oil Company and offered them prospecting rights over 45 per cent of the Island, with the first choice of area. The remainder of the Island was offered to an American company. The British Union Oil Company refused the offer and broke off negotiations, but the American company, after securing some modifications of the terms, took up rights over 50 per cent of the Island. The remaining 50 per cent has not yet been allocated.

British Empire Oil

Asked on July 23 what steps were being taken by H.M. Government to find new and more dependable sources of oil within the British Empire, the Minister of Fuel and Power said: The oil companies are spending large sums in prospecting for new sources of oil supply in the British Commonwealth and Empire. It has not hitherto been thought necessary or desirable that His Majesty's Government in the United Kingdom should also undertake this work.

The questioner then asked whether the Minister was aware that in one Dominion alone there were 160 oil companies operating who were not operating in 1946, and that not one of them was a British company? The Minister was further asked if he was aware of the difficulty the British investor in Britain had in increasing his investment in the Canadian oil industry. The Minister said he was aware of the difficulties but was not sure that he could do much about them.

On July 31 the Chancellor of the Exchequer said that he would make dollars available for British capital investment in oil development in Alaska if he was satisfied that a sufficiently good case existed.

★ ★ ★

COMPANY PRODUCTION
CRUDE OIL 1951

	June *Tons*
Kuwait Oil Co	
Kuwait	2,142,431
Anglo-Iranian Oil Co	
Persia	2,504,000
	July *Brl*
British Controlled Oilfields Ltd	
Venezuela:	
Western Area	13,965
Central Area	16,484
Trinidad Petroleum Development Co. Ltd.	251,791

★ ★ ★

Laboratory Equipment. The twelfth edition of Vol 1 (general section) of A. Gallenkamp & Co's catalogue, has now appeared. Titled "Laboratory Equipment and Scientific Apparatus," the book comprises 838 pages and includes a comprehensive index. This volume supersedes the 11th (1939) edition and Messrs Gallenkamp hope to publish shortly revised editions of Vol II "Industrial Section," and Vol III "Pathology, Biology, Agriculture, Food Technology, Water, Sewage."

Tests of a new type of four-wheel drive heavy truck costing about £3000, showed that, when the point of balance was reached in loading a heavy weight, the front of the vehicle would rise to an angle of some 50°. Shell have ordered six for use at Seria oilfield.

A GLOSSARY OF PETROLEUM TERMS

For some time the Nomenclature Sub-Committee of the Standardization Committee of the Institute of Petroleum has been working on the task of preparing a glossary of petroleum terms, the proviso being that the definitions should be in such language that those not versed in the technicalities of petroleum could gain some benefit from it.

The Sub-Committee is still working on the glossary, but as an interim measure has issued the first part of its work in booklet form. This booklet of 16 pages deals with the more widely-known petroleum products and terms used in the industry and gives definitions of 117 items.

The price is 1/- (1/3d. by post) and copies are obtainable from the offices of the Institute. In order to avoid unnecessary book-keeping, it is requested that a remittance accompanies an order.

★ ★ ★

L.P.G. In "What goes on inside the cylinder," the author, H. L. Benn, describes briefly and clearly, in booklet form, some of the uses of liquefied petroleum gases, how the gas cylinders operate, and adds some "do's and don'ts" for users. Copies from the author at Ty'n-y-coed, nr Mold, Flintshire, price 6s. a dozen.

CONSTRUCTION STARTED AT SARNIA

Construction work has started on Canada's largest fluid catalytic cracker —its capacity is rated at 25,000 b.d. This is part of a modernization programme being undertaken by Imperial Oil Ltd. at its Sarnia (Ontario) refinery. The M.W. Kellogg Co. through its subsidiary, Canadian Kellogg Company, Ltd. is also scheduled to build 46,500 b.d., two-stage vacuum and atmospheric distillation unit, as well as a light ends recovery system.

When the equipment is on stream, the refinery's capacity will be increased by almost 30 per cent, or to 71,000 b.d.

SHELL SCHOLARSHIPS

New scholarships and bursaries have been endowed by Shell to assist boys to train as merchant navy officers. The scholarships, which will be available at each of three training establishments, H.M.S. "Conway," H.M.S. "Worcester" and the Gordonstoun School in Scotland, are awarded annually and are tenable for two years. In addition, an annual grant of £300, for the provision of bursaries, is being made to the Nautical College, Pangbourne.

BIRMINGHAM UNIVERSITY DEGREES

At the Degree Congregations on June 30 Honorary Degrees were conferred on a number of distinguished persons, including Sir William Fraser, C.B.E., F.Inst.Pet., and The Rt Hon Lord Leathers of Purfleet, P.C., C.H., M.Inst.Pet., both of whom received the Degree of Doctor of Laws.

The degrees were conferred by the chancellor, the Rt Hon Anthony Eden, M.C., P.C., D.C.L., LL.D., M.P. The recipients were introduced by the Public Orator, Prof O. H. Phillips, who in the course of his introduction of Sir William Fraser said that the British Government had found Sir William's services indispensable. A close association with the Admiralty dated from 1914, he had been honorary petroleum adviser to the War Office for 16 years, and recently the Minister of Fuel and Power had appointed him chairman of the new Oil Supply Advisory Committee. In 1941 he succeeded Lord Cadman as chairman of Anglo-Iranian Oil Co and that company's generous gifts to the Department of Chemical Engineering and the Halls of Residence, begun under one chairman, had continued under the other. Sir William was also the first recipient of the Cadman Memorial Medal of the Institute of Petroleum.

Of Lord Leathers, the Public Orator said that in May 1941 the Ministries of Shipping and Transport were remodelled and combined as the Ministry of War Transport under him. Mr Churchill had written: "Henceforward to the end of the war Lord Leathers remained in complete control of the Ministry of War Transport and his reputation grew with every one of the four years that passed .... Leathers was an immense help to me in the conduct of the war .... Several times when all staff and departmental processes had failed to solve the problems of moving an extra division .... or of meeting some other need, I made a personal appeal to him and the difficulties seemed to disappear as if by magic."

Degrees were also conferred upon the following Student Members of the Institute:—

David Frank Jacques (Ph.D.)
George Gordon Betts (B.Sc. Class I)
George Anthony Lee (B.Sc., Class I)
John Patrick Duffy (B.Sc., Class II, Divn. I)
Herbert Arthur Trevor Howe (B.Sc., Class II, Divn. I)
David Rowland Morris (B.Sc., Class II, Divn. I)
Geoffrey Randall Basker (B.Sc., Class II, Divn. II)
Jacek Makowski (B.Sc., Class II, Divn. II)
Kenneth William Mulberry (B.Sc., Class II, Divn. II)
David Anthony Pike (B.Sc., Class II, Divn. II)

★ ★ ★

ASTM FIFTIETH ANNIVERSARY

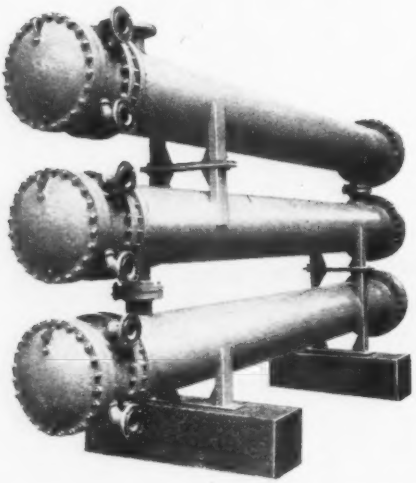
Officially incorporated as a national society in 1902, although functioning as a committee from 1898, the ASTM will celebrate its golden jubilee in 1952 during its annual meeting in New York, June 23-27. Headquarters will be the Hotel Statler and special events are being planned.

★ ★ ★

SITUATIONS VACANT

CHEMICAL ENGINEER — Outstanding opportunity in London with internationally known firm of Engineers to the oil and chemical industries, for Senior Chemical Engineer, capable of creative thought on new projects; development of processing methods; supervision of design detail; flow diagrams and equipment schedules. Salary commensurate with capabilities and accomplishments. The Lummus Company Ltd., Imperial House, 80 Regent Street, London, W.1.

Heat Exchange Equipment



GAS OIL/CRUDE HEAT EXCHANGERS

Total Surface - - - - - - - 1680 sq. ft.

We are specialists in the design and fabrication of all types of heat exchangers and shall be pleased to submit proposals to meet your most exacting requirements.

Let us solve your heat exchange problems to your entire satisfaction.

A. F. CRAIG & CO., LTD.

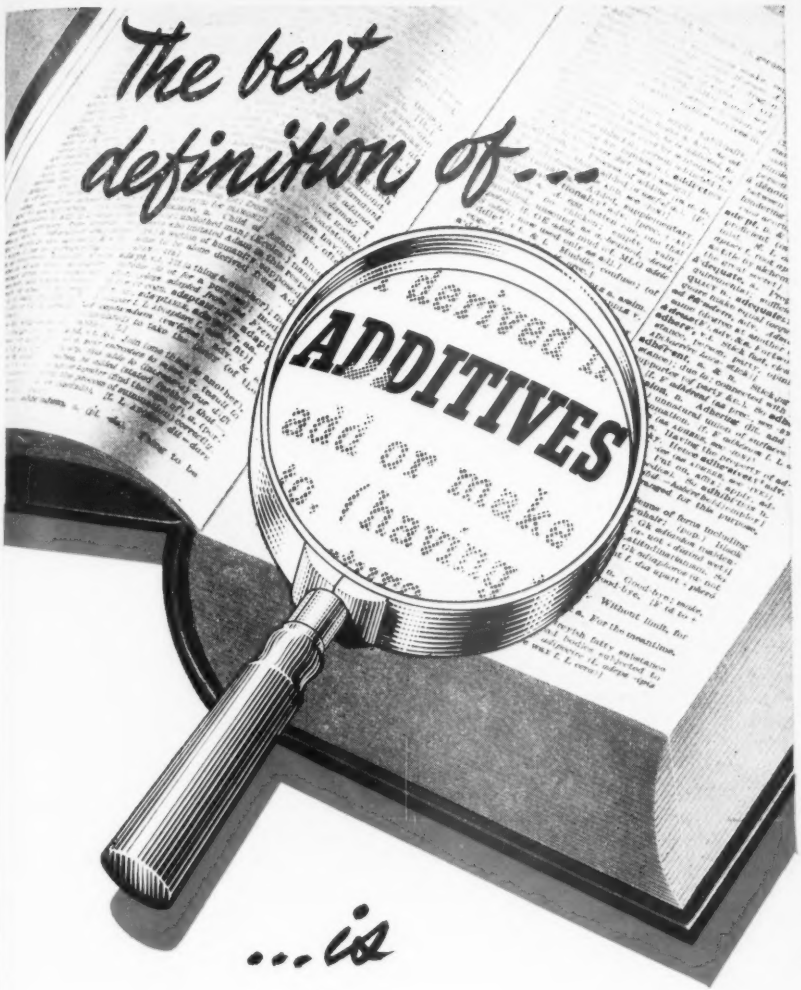
CALEDONIA ENGINEERING WORKS

PAISLEY SCOTLAND

London Office 727 Salisbury House, London Wall, E.C.2. *Telephone:* MONARCH 4756

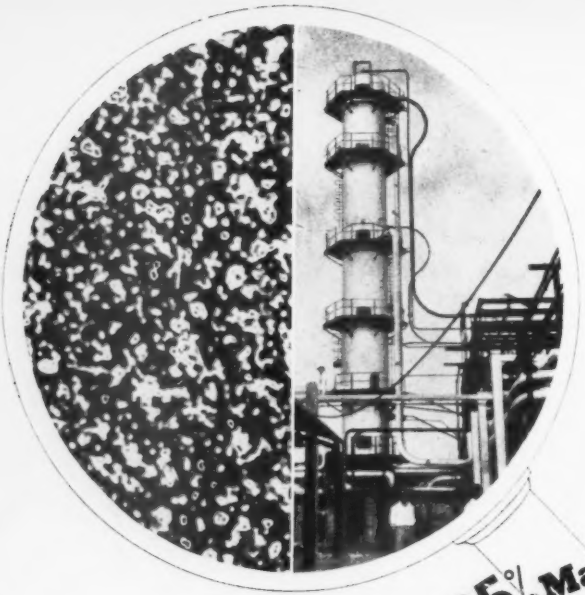
American Associates

THE KOCH ENGINEERING COMPANY, INC., WICHITA, KANSAS



PARAMINS

ESSO PETROLEUM COMPANY, LIMITED, 36 QUEEN ANNE'S GATE, LONDON, S.W.1



Take a good look at 85% Magnesia

More air cells . . . greater heat conservation

Distribution of air cells *inside* insulation controls the efficiency. In Darlington 85% Magnesia a maximum number of these vital air cells is created and evenly dispersed by the regular crystal structure of magnesium carbonate. Darlington 85% Magnesia possesses the stability and high thermal resistance which make it the ideal insulation for refining plant.

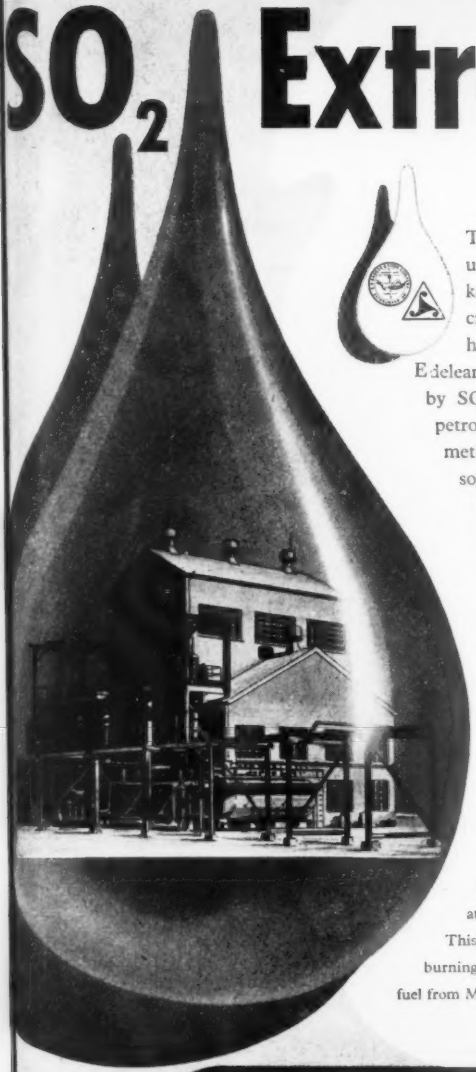
DARLINGTON
85% MAGNESIA
Insulation

YOU HAVE A PROBLEM. The technical division of the Darlington group of companies will design and instal an insulation scheme to meet your needs.

Manufacturers:
THE CHEMICAL & INSULATING CO., LTD., DARLINGTON

Insulation Contractors: THE DARLINGTON INSULATION CO., LTD., NEWCASTLE UPON TYNE.
Sheet Metal Fabricators: S. T. TAYLOR & SONS, LTD., TEAM VALLEY, GATESHEAD.

SO_2 Extraction



The Edeleanu Process has long been used for the production of high quality kerosenes from aromatic and high-sulfur crudes. For many years, Badger engineers have been expert in the utilization of the Edeleanu Process, and have applied extraction by SO_2 to the refining of a wide range of petroleum fractions. Uses include improved methods of producing pure aromatics, special solvents, transformer oils, clean burning furnace oils, and high cetane diesel fuels. With the supply trend toward crudes of more difficult refining characteristics, industry is turning more and more towards SO_2 extraction. Badger's experience in the development and application of SO_2 extraction is proven by many Badger-built SO_2 units working successfully for refineries in Europe and abroad.

An 1,800 BSD Charge Capacity SO_2 Extraction Unit recently engineered by Badger for Caltex Petroleum Maatschappij, (Nederland) N.V. at Pernis, Rotterdam, Holland. This plant produces high grade burning kerosene and turbo jet fuel from Middle Eastern crude.

E. B. BADGER & SONS (GREAT BRITAIN) LTD.
99 ALDWYCH LONDON W.C.2
Process Engineers and Constructors for the Petroleum, Chemical and Petro-Chemical Industries

TOWARDS
BROWN

Better LUBRICATION

The continued rapid development of the internal combustion engine has demanded a parallel improvement of lubricants to cope with higher stresses and power outputs. The increasing utilisation of oils treated with chemical additives has enabled this need to be met.

Monsanto products are playing their part in enabling the oil industry to keep one move ahead of users' requirements.

Monsanto have been "in" on oil additives from early days and have made a real contribution to their development. Immediately at the end of the war they were able to offer a variety of additives for peace time needs.

Monsanto's oil additives are now produced at the new factory at Newport, Mon. Applicational research facilities are centralised at Fulmer and the illustration shows a modern test installation in which the engine performance of a lubricant may be plotted either for routine check of quality or for the development of new additive-lubricating oil combinations.

Pour point depressant **SANTOPOUR B**

Motor oil inhibitors

SANTOLUBE 398, 398M, 394C

Motor oil detergent

SANTOLUBE 203A

Medium and heavy duty combinations

SANTOLUBE 204, 205, 388, 382

CHEMICALS FOR EVERY INDUSTRY
throughout the world

MONSANTO
CHEMICALS—PLASTICS

MONSANTO CHEMICALS LTD., Victoria Station House, London, S.W.1.

To be sure...

E-Mil

GOLD LINE and GREEN LINE

and be *sure* of the FINEST Laboratory Glassware and Thermometers

The photograph shows part of one of the laboratories of the Standards Department of the Boots Pure Drug Co. Ltd., who use and specify E-Mil apparatus. Obtainable through all laboratory furnishers.

H. J. ELLIOTT LTD., E-Mil Works, Treforest, Nr. Pontypridd, Glam.

The

LOVIBOND COMPARATOR

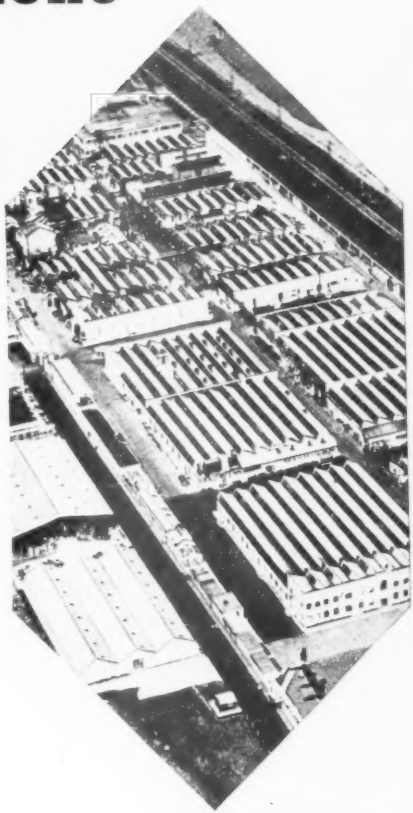
with permanent glass colour standards for the new S.T.P.T.C. benzole tests:

CARBON DISULPHIDE
THIOPHEN
CORROSIVE SULPHUR

ALL AVAILABLE FROM STOCK

SOLE MAKERS: **THE TINTOMETER LIMITED, SALISBURY, WILTS.**

Hydroquinone - M&B



Hydroquinone finds wide use in industry where its properties as a stabilizer and anti-oxidant have proved invaluable in a number of applications.

Hydroquinone—M&B is manufactured at Dagenham in the largest and most up-to-date plant of its kind in Europe. The required high standards of purity and uniformity are assured by a rigid system of analytical control.

MAY & BAKER LTD DAGENHAM

Telephone : ILFord 3060 *Extension 219*

Associated Houses · Sydney · Bombay · Port Elizabeth · Montreal · Wellington · Lagos

Branches and Agents throughout the World

CH3294

SWITCH AND CONTROL GEAR

CHIEF PRODUCTS

CONTACTOR STARTERS

TOTALLY ENCLOSED
UP TO 450 H.P. AT 660 V
UP TO 250 H.P. AT 3,300 V

FLAMEPROOF
UP TO 300 H.P. AT 660 V.
UP TO 250 H.P. AT 3,300 V

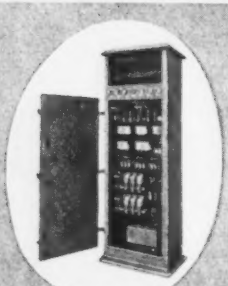
MINING SWITCHGEAR

A COMPREHENSIVE RANGE OF CONTROL GEAR AND ACCESSORIES FOR COAL-CUTTERS, CONVEYORS, LOADERS, DRILLS AND HAULAGE.

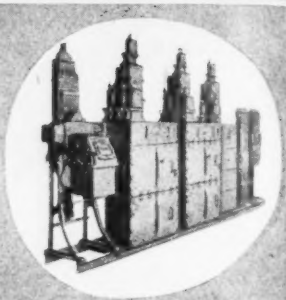
OIL-BREAK SWITCHGEAR

TOTALLY ENCLOSED
UP TO 3,000 AMPS. AT 660 V
UP TO 400 AMPS. AT 3,300 V

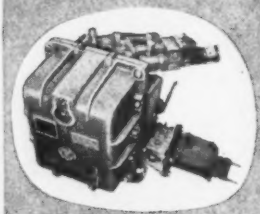
FLAMEPROOF
UP TO 400 AMPS. AT 660 V.
UP TO 400 AMPS. AT 3,300 V.



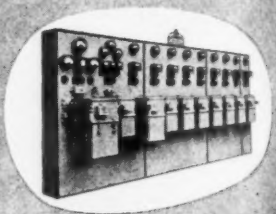
INTERLOCKED CONTACTOR PANEL CONTROLLING MULTI-MOTOR GRINDER



FLAMEPROOF STARTER BOARD



ROOM SWITCH TO CONTROL COAL FACE MACHINERY



OIL-BREAK SWITCHGEAR

TYPICAL PRODUCTS WHICH EMBODY THE RESULTS OF OVER 60 YEARS EXPERIENCE IN THE DESIGN, MANUFACTURE AND SERVICE OF RELIABLE SWITCH AND CONTROL GEAR.

M.&C. SWITCHGEAR LTD.,

KIRKINTILLOCH, GLASGOW.

Telephone:
Clerkenwell 2908

Telegraphic Address:
"Gasthermo, Barb, London"

The mark of precision and efficiency
BRITISH MADE THROUGHOUT

B. BLACK & SON, LTD.

180 Goswell Road, London, E.C.1

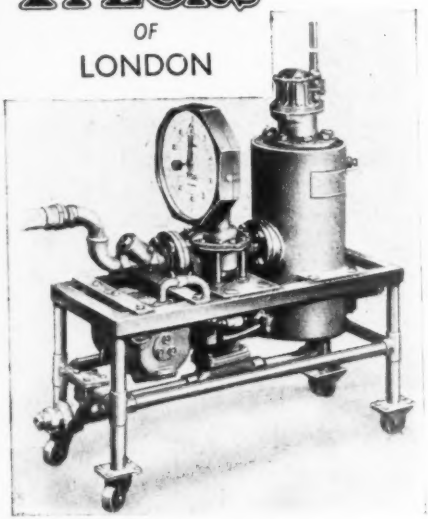
MANUFACTURERS OF LABORATORY THERMOMETERS

Fluid-in-Glass Thermometers graduated on stem, for determining temperatures between — 200/+550 C. with an accuracy, corrections and permanency well within the limits permissible to obtain N.P.L. Certificates.

The filling in the etchings is heat resisting and is insoluble in all solvents with the exception of those that attack the glass itself.

MAKERS OF THERMOMETERS TO ALL SPECIFICATIONS FOR PETROLEUM TESTS

TYLORS
OF
LONDON



MANUFACTURERS
OF
METERS
FOR
PETROLEUM
PRODUCTS

Tylor bulk petrol meter is approved by the Board of Trade (Standards Dept.)

FLOW CONTROL PROBLEMS OUR SPECIALITY

Illustration shows Motor-driven Portable Unit with Air Elimination Device

HEAD OFFICE AND WORKS
BELLE ISLE
LONDON, N.7

STEELS

for the Petroleum Industry

This organisation has made a special study of steel requirements of the petroleum industry: plates for fusion welded vessels; constructional steel; forgings; alloy steels, including corrosion and heat-resisting types; etc. The Technical Departments will be pleased to discuss specific applications with manufacturers of petroleum equipment.

THE UNITED STEEL COMPANIES LTD

THE UNITED STEEL COMPANIES LIMITED

17 WESTBOURNE ROAD · SHEFFIELD 10 · ENGLAND

Richmond Hill Printing Works, Ltd., Bournemouth

Fo

For precision viscometry...

Gallenkamp

THERMOSTATIC WATER-BATHS

For use in the determination of kinematic viscosity by the capillary viscosity method. Suitable for methods described in I.P. 71/47 (T), B.S. 188, and A.S.T.M. D.445-46 (T).

Full particulars sent on request

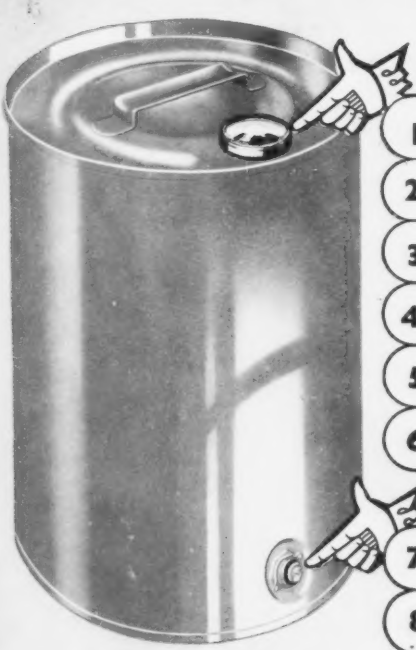
A. GALLENKAMP & Co., LTD.

Manufacturers of Modern Laboratory Equipment and Scientific Apparatus

17-29 SUN STREET, LONDON, E.C.2

IT'S **10-1** YOU DIDN'T KNOW

that the STANDARD FLAT TOP DRUM was such a versatile container!



HEAD FITTINGS:

1. 50 mm. Press Cap, liner, overseal.
2. 50 mm. Press Cap, liner, overseal and PPP Spout.
3. 3" Drawn Neck, inner plug and capseal.
4. 3" Filling Hole and expandable lid.
5. 7" Filling Hole and spun-on lid.
6. 2" or 1½" 'Tri-Sure' flanges and bungs.

BODY FITTINGS:

7. 3/4" 'Tri-Sure' Flange, bung and tap.
8. 3/4" Telescopic tap.
9. Tin Tagger.
10. Top and bottom seams may be welded after double seaming.

With a suitable fitting in the body and/or head of the container it may be utilized for the carriage and storage of a wide variety of liquids, semi-solids and powders. These drums are manufactured in gauges ranging from 26BG to 20BG according to requirements; capacities available are from 2 to 10 gallons.

METAL CONTAINERS

METAL CONTAINERS LTD., 17 WATERLOO PLACE, PALL MALL, LONDO

WORKS: ELLESMERE PORT & RENFREW. ASSOCIATED COMPANIES OVERSEA

NDO
RSEA